Library Liberation Through Time Optimization

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ABSTRACT
Time is an extremely valuable resource for most students, and the library is where many students spend most of their time through out their academic careers. In this paper we present solutions to identified time wasting tasks inside a university library. Our approach to these solutions is based upon data collected from the library's population. All of the solutions were developed to help streamline routine tasks performed in the library, and allow for students to spend more of their time focusing on their ultimate goal of research and study.

Categories and Subject Descriptors

General Terms
Design, Performance, Security, Human Factors, Reliability, Management

Keywords
Wayfinding, Spatial Cognition, Visibility, Internal Consistency

1. INTRODUCTION
The library is a place where most students spend a large portion of their academic career, attempting to keep up with assignments. Observation of various operations of the library raise questions of how effective is the use of the library for students in getting their tasks completed and how does the environment they interact with impede or enhance this process? To students, time is extremely valuable, therefore in order to create the most positive user experience, understanding what enhances or impedes the library experience can be beneficial to both students and the university's library system.

In this work, we investigate various tasks that students perform when using the library and identify the most crucial artifacts used in the completion of these tasks. Furthermore, the investigations in this work helped us isolate issues surrounding the completion of some of these tasks and how the artifacts used played a role in their current activities goal. The issues that we identify in this study are seating in the library, outlet and food availability, and noise, as we determined that these three themes greatly impact the student's user experience of the library.

In order to gather a better understanding of the needs of students in the library, we conducted a survey of the population within the library. Our initial findings helped us better understand our users needs in the library setting and allowed us to begin developing some solutions to enhance overall user experience. Furthermore, there were notable constraints and limitations to creating our solutions, including the inability to remodel or rebuild the structure of the library, uncontrollable elements such as students' behavior in the library as it relates to library etiquette, and the need to create solutions within a modest budget. In this paper, we address these issues and limitations through the development of novel approaches that assist in streamlining the identified activities and tasks resulting in the reduction of time spent completing these activities.

2. DATA COLLECTION METHODS
Aside from naturalist observation as a source of data collection, several other methods were adopted. These methods used in our study were; Task Walk-Through, Shadowing, Site visits and Questionnaire. Each of these data collection methods will be explained in detail for why they were chosen to be used in this study but the data amassed from all the differing methods will be presented as a whole in the Data Collection Results section.

The rationale for the use of Task Walk-Through in our analysis is that many of the commonly performed tasks in the library have been drilled into people; the general population may not realize many of the subconscious aspects of tasks they perform. Walk-through by members of the group helped identify themes that would have gone unnoticed in surveys, interviews and other general public avenues. This will provide information that will aid in the breakdown of the subtasks and expose the complexity of seemingly simplistic tasks. This method was executed by performing multiple walk throughs of the task(s), both verbally and physically. Participants were asked to start from the beginning of the task, and to go in order through to completion. We ensured that they mentioned and elaborated on smaller aspects of the experience, in order to establish a complete summary of the task performed. This process was documented through use of photography, so that breakdown of the actions could be reviewed and further analyzed. The information collected from the task walk-through was further supported by the shadowing method of data collection.

The Shadowing method of data collection was used instead of talking out loud or other methods that involve direct contact from the observers while the individuals were in action. This non-direct method provides information about natural habits that are not influenced by observer interference. The Shadowing method of data collection provides information about differing habits and patterns of library users. Members of our research team followed individuals that entered the library at a distance, while still in sight. We recorded where the shadowed person went to, mistakes and other patterns that arise. It was also important to record who they were meeting and what their purpose in the library appeared to be. The shadow will be recorded with log sheets that organize the destination, purpose, method of entrance and path through the library. While shadowing provided an indirect information source,

the use of Site Visits allowed our group to fully understand the environment that library users interact with.
Site Visit provides information on the natural environment and allows for a better understanding of resources available through the researcher's personal experience. Through multiple site visits identifying important interactions with other people and artifacts will be isolated. The site visit will provide personal experience with the environment that is being focused on and identification of commonly used artifacts. Group members spent time both passively and actively in the library environment over the course of weeks. Each research team member recorded their experience on an online message board to each other. The members reported common artifacts and interactions from a variety of areas within the library. While Site Visits allowed our group members to gain a holistic understanding of the user's issues from an outside perspective, the use of a Questionnaire allowed our group access into our users' opinion on topics we identified as possible issues.
The Questionnaire provided our team with information on the demographics of our population such as gender, age and academic year. The method allowed our group to collect information about problems in the library from a large number of users. The data resulting from the questionnaire provides quantitative support for our isolated issues with the library environment.

3. DATA COLLECTION RESULTS

Initial naturalistic observations displayed users having difficulty finding artifacts, problems with sound levels, and resource availability. These conclusions were developed based on the problems reflected in the data collection methods results. The differing methods applied in our study provided the focus for the next method adopted.

The task walk-through revealed that a significant portion of time in the library is dedicated to preparing and collecting artifacts needed to complete academic work. Many users, when asked to locate a book on a topic display, had little difficulty finding the book in the online catalogue system, but when they were asked to physically retrieve the book, problems became apparent. Users had trouble finding the book due to poor signage, which lacked visibility from more than one angle. In order to clarify that the observed issues in the task walk-through portrayed a true representation of the user population, and not a manifestation the observed user's nerves, a Shadowing method was adopted.

The Shadowing method provided supporting observations for the identified user issues, revealed in task walk-through results. Users spent significant amount of time trying to find artifacts such as outlets and books. Our team also observed while shadowing, that there was a distinct separation in the purpose of the users of the library. Some users arrived in the library and immediately gravitated toward group members and friends. Meanwhile a different subset of users headed directly upstairs toward the "quiet" floors to work isolated. Both types of users were observed spending a portion of time just locating classmates or isolated work areas. The resulting problems identified in the task walk-through and shadow methods of data collection provided themes for focus, but needed a stronger observational support.

The Site Visit methods were used to provide the necessary support. User problems identified earlier were supported through these observations. Another problem was also established during these collection periods; users displayed increased irritation and loss of focus when those around them used electronic communication devices. The problems identified in our prior mentioned methods provided qualitative support for the issues under concern, but it was necessary for solidification of these problems, that additional questionnaire data be collected.

The questionnaire pool consisted of 36 library users. The questionnaire revealed the demographics of the users. The users group sampled consisted of 22 males and 14 females, ranging in academic years where the two highest represented population were Juniors (10) and Graduate students (9). Even with these two groups of users being the largest presence in the data set, they displayed the higher scores of frustration with aspects of the library. The data set when segregated by academic year displays a trend that as academic year increased, the frustrations with artifact availability, sound levels and resource availability aspects of the library increase. This gradual increase in frustrations seems to be a function of time spent in the library and course work load. This conclusion is based upon the two largely represented group being juniors, who are concerned with high academic excellence because of graduate applications and co-ops. Graduate students are stressed with keeping high marks for PhD programs and job marketability. The problems with artifact availability (outlets, computers and work stations), sound levels (cell phones and loud groups), and resource availability (food and books) have one common feature. They all create distractions from finishing work by wasting time.

	Freshman	Sophomore	Junior	Senior	Graduate
Artifact Availability	1	1	1	1	2
Sound levels	2	2	2	3	2
Resource Availability	2	2	2	3	3
Based on 36 Users	1= Not a problem	2=Annoying	3=Struggles with	4= Don't Like it	5= Hate it

Figure 1. Questionnaire responses to issues in the library setting

4. SOLUTIONS

In our approach we also identified various constraints in our activities prior to developing our solutions. Our identified constraints included our inability to build a new library or remodel the current library, or to control the behavior of people in the library. Additionally, our solutions need to be created within a modest budget. Furthermore, these constraints resulted in the identification of design requirements. Some of these requirements include the reduction of time spent traveling, making use of the current library physical layout, the solutions benefits must outweigh the cost, and the solutions must be transferable to other libraries.

4.1 Boran Sound Level Display

Entering an unfamiliar building and searching for a particular room is a common, but sometimes difficult task in everyday life (Broamle, et al.) Weisman (1981) identified four major variables that influence wayfinding: (a) visual access, (b) architectural differentiation, (c) floor plan complexity, and (d) signage and room numbers. Furthermore, Gärling, Lindberg & Mäntylä (1983) presented evidence that showing a floor map to participants immediately prior to testing reduced the effects of unfamiliarity with the building and improved wayfinding performance.

As our investigation and data show, sound levels greatly enhance or impede the user experiences of the library. Our proposed approach to controlling users' wayfinding based on sound levels involves the development of the "Boran Sound Level Display." This solution adapts one of Weisman's (1981) variables, visual access. Through the placement of microphones throughout the library, a large screen display monitor would present to the students upon entering the library both the layout of the library and the current noise and comfort levels of each zone by floor. The animation would rotate through each of the different floors.

This solution enhances the user experience by providing the student with timely information on where the loudest and quietest areas of the library are, on a real-time basis. This would be particularly helpful for those looking to participate in group study (a louder setting) and those looking to conduct individual study (more quiet setting).

Figure 1. Boran Sound Level Display

4.2 Snack Cart

Structurally, the library is a large space with many floors located at the center of campus where dining options are few. These are typical and normal constraints of the library when it comes to retrieving food. However, due to the long periods of time students spend inside the library, much time is wasted when a student has the need to satisfy their hunger. Our data showed that students felt retrieving food was a burdensome, time consuming inconvenience because each time they were hungry they would have to pack up their belongings and leave their spot in the library to get food. Our proposed solution to this issue is the implementation of a food cart that is brought around as a library worker restocks books. If a student wants a snack they only have to locate the snack cart inside of the library and they can buy the snacks from the librarian.

This solution relates to food vending carts, and particularly to a cart adapted to be wheeled about from place to place and carry a supply of food and beverages. In addition to meeting library guest needs, convenience carts are a revenue producing opportunity that organizations should not overlook (Holtzman, 1998).

Figure 2. Snack Cart

4.3 Portable Phone Area

Wei and Leung (1999) found that the majority of calls being made by mobile phone users take place on streets, public transport, shops, and restaurants. Mobile phones now occupy social spaces, spaces with norms that sometimes conflict such as the space of mobile phone user and the virtual space where the conversation takes place (Palen et al., 2000). Ling (1997) discusses how mobile phones used in public spaces have become an element in the definition of socially appropriate/inappropriate behavior. As we have previously identified, sound disruptions contribute greatly to impeding library users' experience. One of the biggest sound disruptions in the library are others talking on their phones and phones ringing. We have identified the need for a specified area inside of the library so that students can take quick phone calls without having to exit the library completely and without disrupting others around them. Our solution consists of a tall board with a cushioned headrest that can be placed in an area away from others and provides a highly visible social cue.

Figure 3. Portable Phone Area

Meyrowitz (1985) stated that individuals construct social situations. He implied that there is some sort of social perception taking place on the part of the individual, which is developed by the individual into a "social schema" that will influence their feelings, thoughts and actions in social situations. Figure 4 below was a model developed by Meyrowitz that demonstrates peoples' behavior in relation to mobile phone use in public spaces.

We propose that our portable phone area will function as a mediator in the development of a social schema, working as a social cue establishing the appropriate behavior for the mobile phone user.

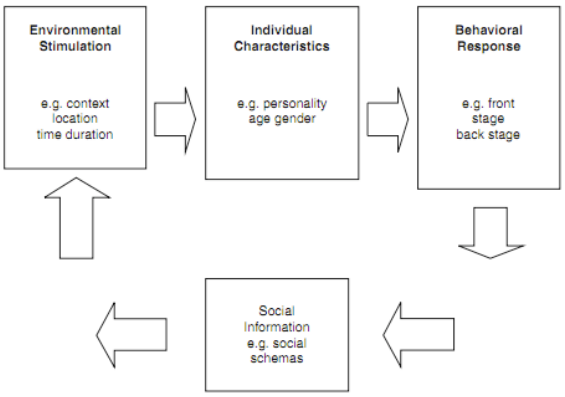

Figure 4. Model of peoples' behavior in relation to mobile phone use in public spaces.

5. CONCLUSION

This paper has presented approaches for enhancing the user experience at the library, with a focus on time optimization. It differs significantly from prior work in the area of library usability in that our approach discovered issues that significantly impact the experience and productive time spent at the library. Our solutions aim to streamline time consuming tasks to facilitate a more enjoyable and productive atmosphere for students.

6. FUTURE WORK

The findings reported in this paper introduce numerous additional questions and issues feasible for future study. We plan to extend the work to include additional solutions to streamlining time consuming processes, and solutions to make the library a more enjoyable and comfortable place. We believe this will enrich the experience of library users and create a more productive environment.

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